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Strategic EAF Planning

The future combat support system should be designed to maintain readiness levels to support immediate deployments, provide responsive support to deal with unanticipated events, provide support for the full spectrum of potential operations, transition support effectively as the units move along the spectrum of operations, and be efficient and affordable.

Expeditionary Airpower Part 2

Robert S. Tripp, PhD, RAND
Lionel A. Galway, PhD, RAND
Timothy L. Ramey, PhD, RAND
Paul S. Killingsworth, PhD, RAND
CMSgt John G. Drew, AFLMA
C. Chris Fair, RAND

A key challenge for the Air Force in the future is strategic planning to support the Expeditionary Aerospace Force (EAF). The EAF concept requires a rethinking of the entire combat support system, and subsequently the strategic planning framework for combat support should also be reexamined and enhanced. To a large degree, future global combat capability will be dependent upon strategic choices concerning combat support system design that will be made in the near future.

The EAF and Combat Support System Planning

Under the EAF concept, the Air Force is divided into several Air Expeditionary Forces (AEF), each roughly equivalent in capability, among which deployment responsibilities will be rotated.[1] Each AEF is required to be able to project highly capable and tailored force packages, largely from the continental United States (CONUS), on short notice anywhere around the world in response to a wide range of possible operations. This concept requires the ability to deploy and employ quickly, adapt rapidly to changes in the scenario, and sustain operations indefinitely. To meet the demanding timelines, units must be able to deploy and set up logistics production processes quickly. Deploying units will, therefore, have to minimize deployment support. This, in turn, demands the support system be able to ensure the delivery of sufficient resources when needed to sustain operations.

To meet these operational requirements, the future combat support system should be designed to maintain readiness levels to support immediate deployments, provide responsive support to deal with unanticipated events, provide support for the full spectrum of potential operations, transition support effectively as the units move along the spectrum of operations (transportation from one kind of operation to another), and be efficient and affordable. Moreover, maintaining readiness to meet potential major theater war (MTW) requirements while a significant portion of the force is temporarily deployed to meet boiling peacetime commitments presents additional support challenges. These challenges differ considerably from those posed by Cold War employment concepts and require a complete reexamination of the combat support system to determine how they can best be met. Strategic Agile Combat Support (ACS) design trade-off and investment decisions need to be made in the near term to create the ACS capabilities necessary to achieve the operational capabilities required in the future.

Focus on Strategic Planning

The time horizon over which planning is done determines a number of key planning process characteristics. These include the response time required to construct a plan, level of detail of inputs, and flexibility of available resources. Planning for the ACS system could operate on three different time horizons at the:

- Level of execution (days to weeks): the ACS system should support ongoing operations.
- Midterm or strategic level[2] (months to years): the system should acquire or construct resources to support the current force structure across the full spectrum of operations and in any location critical to US interests, subject to peacetime cost constraints.
- Long-term level (decades): the ACS mobility system and its strategic infrastructure should be modified to support new force structures as they come on line and to utilize new technologies.

While much of the Air Force's attention has been focused on the execution time horizon to support the EAF, this segment of research concentrates on an integrated planning framework that addresses strategic decisions. These ACS system design and policy issue planning decisions made in peacetime affect the logistics footprint, closure time, peacetime costs, and other important metrics for evaluating support of expeditionary operations. The goal of this research is to begin formulating a strategic planning process that addresses how to make decisions about infrastructure development, resource positioning at forward or rear locations, and other policies and practices affecting logistics support.

An Enhanced Strategic ACS Planning Framework for the Expeditionary Aerospace Force

A detailed, continuous, careful end-to-end planning process focusing on strategic time horizons is required to develop the infrastructure necessary to transition to the EAF effectively and efficiently. Further, much, if not most, support effectiveness comes from planning and decisions made for these longer time horizons where options include redesigning support equipment, developing support processes and infrastructure, setting up prepositioned resources, and negotiating base access and relationships with coalition partners.

Characteristics of Strategic ACS Planning in the EAF Environment

Generally, a strategic ACS planning system for the new environment should assess how alternative logistics designs affect a number of important metrics. These include timelines to achieve the desired operational

capabilities, peacetime costs, risks, and flexibility. It should also provide feedback as to how well the existing ACS system meets the spectrum of operational requirements. In comparing the current planning system with the ACS planning requirements for the EAF concept, enhancements should be made in the following areas:

- **Supporting the entire spectrum of operations.** The current planning system assumes that combat support capabilities designed for MTW scenarios can handle any situation. However, resources required to support peacetime operations (missions other than war) may be greater than or differ substantially from those required for MTWs.
- **Dealing with uncertainty.** Expeditionary operations are fraught with uncertainty. For example, denial of base access may require both preparation of several reception sites (forward operating locations) to support combat operations and minimal resource prepositioning at multiple sites to increase the probability of access. Moreover, there is great uncertainty surrounding the operational scenario, which will greatly affect support resource requirements. For instance, low operating tempos (OPSTEMPOs) may require far less prepositioned resources to meet rapid employment timelines, whereas high OPSTEMPOs may create a need for much more prepositioning. The current planning system, which focuses on MTWs, needs to be enhanced in order to address these uncertainties as well.
- **Evaluating alternative designs for deployment/employment timelines and associated costs.** The EAF concept emphasizes rapid deployment timelines that should be accounted for in future ACS system design. Alternatives to achieve fast deployment (for example, prepositioning equipment, developing FOLs with adequate facilities and resources to support rapid deployments and immediate employment, and developing host nation support agreements) have significant peacetime costs. On the other hand, the timelines might be slightly longer if materiel were held at regional storage sites. This would significantly lower costs. Assessing such trade-offs between timeline, cost, and risk is integral to future strategic ACS system planning. The current support planning system does not address these issues.[3]
- **Integrating ACS planning among support functions and theaters and with operations.** The current combat support planning system is stovepiped in several ways. Each commodity and its support processes are viewed largely independently in order to determine resource requirements. In this fragmented process, opportunities to develop consolidated support operations or other policies that may support more than one theater may be missed. Moreover, feedback needs to be provided among commodity managers (for example, engines and low-altitude navigation and targeting for night) so they may determine how the best support option for one commodity (for example, consolidated intermediate maintenance) may affect the *best* ACS design for the other. Additionally, feedback on support options and costs needs to be provided to operations planners for trade-off analysis decisions. As an example, a deployment window of 96 hours versus 40 hours produces dramatic savings of resources.
- **Integrating the assessment and development process for technology and policy.** In the areas of technology and policy, many different organizations and agencies are pursuing initiatives that are part of the overall ACS system. However, these initiatives are formally uncoordinated below the level of the Air Staff. There has been little attention given to developing a capability that can evaluate options among those sets of competing policies and technologies that may be developed both to produce the most cost-effective global ACS capability and serve multiple theaters and operational scenarios.
- **Controlling variability and improving performance.** Ensuring that a redesigned support process is working and identifying areas for improvement will require monitoring the support system as it evolves, yet feedback for system design improvements is not routinely captured. A few critical parameters drive wartime and peacetime requirements for resources. While some of these parameters are measured, much improvement can be made in controlling their variability. Further, improvement may be made by developing a measurement system that can indicate when corrective action is needed or when the system may need redesigning.[4]

A Framework for Strategic ACS Planning

Employment-driven ACS Requirements Determination

The approach to requirements generation and determination is called *employment driven* because it starts with operational analysis: forces, weapons, OPSTEMPO, and required timelines. These key parameters determine most of the support requirements. This step is the leftmost panel in Figure 1, which depicts the overall approach to analyzing support requirements.

The middle panel represents the requirements determination model, which generates time-phased combat support requirements for each support resource as a function of the operational requirements and alternative logistics policies, practices, and technologies. ACS planning is beset by uncertainties and options. Some simple aggregated spreadsheet models were constructed to compute requirements for fuel, munitions, vehicles, support equipment, and shelters. As these models are easier to specify and run than the usual highly detailed models, they may be used to quickly screen several scenarios permitting a more thorough analysis of uncertainty. Yet, these relatively simple models provide enough detail to estimate the personnel, equipment, and commodity requirements to support alternative operational requirements and the timeframes required to assemble the production function for those commodities and operate them to sustain operations for an operational scenario.

For example, in the fuel model, the refueling system requirements (number of R-9 refuelers) are determined by the aircraft go sequence, aircraft fuel acceptance rates and capacities, and refueling system flow rates. For refueling by truck, the system flow rate would be determined by the truck acceptance rate, distribution system pumping rate (fill stand), and driving time to and from the fill stands. While not a detailed simulation of the fuels support operation, the model can be used to compute requirements for a number of fuel reception, storage, and distribution methods.[5]

As noted in the middle panel of Figure 1, two of the key outputs from the requirements determination models are the initial operating requirement (IOR) and follow-on operating requirement (FOR) for each resource (if applicable). The IOR is the amount of resource that is necessary to initiate and sustain operations while resupply pipelines are initiated for that resource. In the case of munitions, it may be that 3 days are required to reestablish resupply of munitions. Thus, 3 days of munitions would be the IOR. The FOR is the projected amount of the resource that is required during the remainder of the

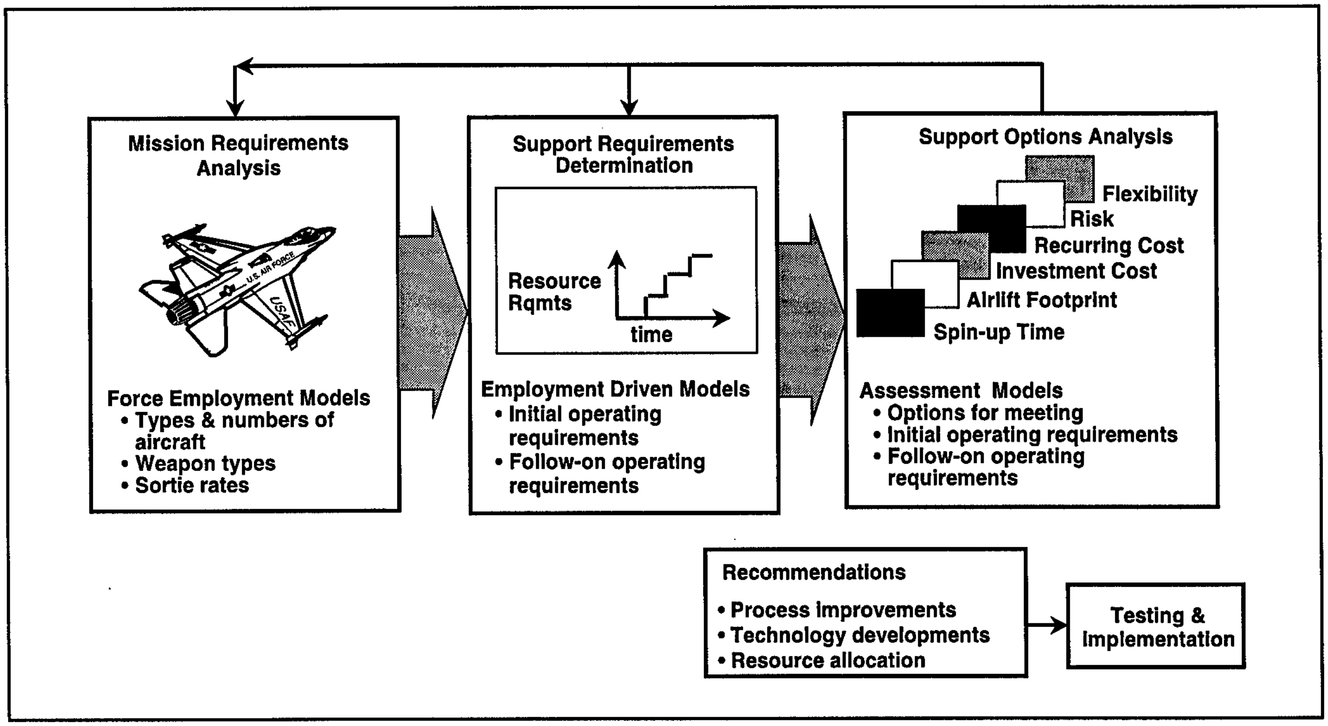

Figure 1. Employment-Driven Combat Support Requirements Generation

planned operation. The FOR can be delivered periodically to keep the flow of resources into the FOL easy to handle by a relatively lean forward support force. These parameters are the key to determining deployment resources and timelines and sizing the resupply capability, respectively.

As depicted in the rightmost panel of Figure 1, the support options for various commodities need to be evaluated across the different phases of operation. As with operational analysis, the aim is to identify support options that provide good performance (in terms of the set of metrics) across all phases of operation and across a range of potential scenarios (the number and range depending on the time horizon under consideration). Again, trade-offs may have to be made across the scenarios and the metrics (for example, a low-cost option may have a large risk). Additionally, support options may be evaluated for different mixes and for CONUS versus forward-based logistics. This approach allows these trade-offs to be made with a clear picture of the effects across different options and scenarios.

Integration of Individual Commodities Options into an ACS System

The next step is to select options in each of the commodity areas to create candidate AEF support concepts. As shown in Figure 2, preliminary work was done on an *integrating model* to choose among the options analyzed. This is a mixed-integer optimization model that selects combinations of the options that meet the objective function subject to several constraints and thereby quickly identifies feasible support concepts. Taken together, these options represent a possible support concept for AEFs that could then be looked at more closely to consider additional issues, such as the flexibility of the concept and its transportation feasibility.

For each commodity considered, the model can select from as many as six alternative ways to provide the resources needed to support operations. Each option has different fixed (investment) and variable (recurring) costs and varies according to its robustness and suitability for long-term use.[6]

The model accounts for such issues by allowing each option to be given a subjective rating with respect to its robustness. It then requires options with low robustness (but high initial deployability) to be replaced by more robust options within a specified period of time.

While the model allows the identification of potential EAF support concepts, it is also useful in answering a range of questions that give insight into the robustness of the concepts. For example, by varying the costs of certain aspects of a concept of operation (CONOP), the *breakpoints* could be identified that would motivate a switch to another CONOP. This allows a number of important questions to be explored; for example, the maximum desirable cost associated with the opening of a new forward support location or how sensitive a CONOP might be to annual transportation costs. Another important issue that can be analyzed by the model is the effect of various levels of airlift availability, which is a key make-or-break assumption associated with each AEF support CONOP. Finally, the payoff of improved technology to lower the deployment footprint of a resource option could be explored. In this way, the effect of an improvement in the deployability of a particular resource on the overall AEF deployment could be gauged.

As the Air Force extends its analysis of support structures beyond single theaters of operation, the complexity of issues will make the application of automated techniques, such as the integrating model, essential. The complex interactions between the region-specific security challenges, mutually supporting theaters, geography, and required levels of responsiveness will create an almost overwhelming number of possible support structures. Automated models such as the integrating model are needed to manage this complexity in order to identify low-cost global support structures for the EAF.

Integration of ACS and the Mobility System

Executing AEF deployments requires that a multitude of mobility-related actions be set in motion. These include forward

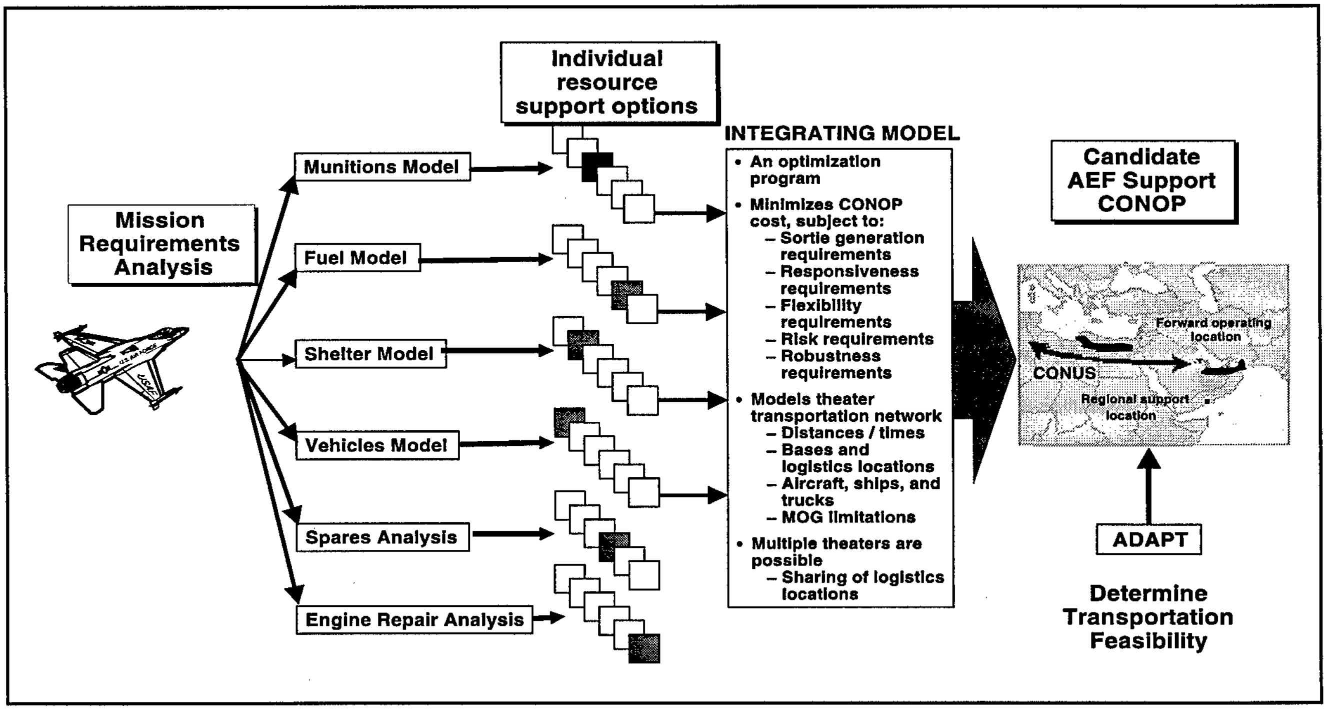

Figure 2. The Integration Model Assists in Choosing Among EAF Support Options

positioning of tankers, deploying aerial port personnel, placing mobility crews in crew rest, and so forth.

Mobility processes comprise a substantial portion of the overall AEF deployment timeline. As interweaving mobility processes with logistics support processes are a key aspect of future AEF Agile Combat Support structures, there should be a way to test the mobility/logistics interfaces for any candidate AEF support structures devised. Toward this end, a high-level simulation model of the air mobility system, called the AEF Deployment and Planning Tool, was developed.[7]

This model provides insight into the chain of mobility-related events that makes AEF deployments possible, and can test the transportation feasibility of possible AEF support structures.

Feedback Loops for Control

The final element of the proposed planning framework is feedback, which provides indications that there are discrepancies between plans and reality. Information on deviations from plans can be used to initiate correctional actions to solve the problems. Two primary feedback loops are envisioned in the planning framework.

The first feedback loop is between logistics planning and operations planning as shown at the top of Figure 1. Operational analysis can provide alternative force packages that can accomplish *equivalent* goals. This is important because the alternative force packages can have very different support requirements.[8]

In some circumstances, logistics constraints may not be removable because some logistics resources may be strongly tied to an expensive and relatively fixed infrastructure that has limited flexibility. For example, fuel resources available within a given country and distribution capabilities to forward operating bases may not be available to support a sustained, high EAF optempo. Operational plans may have to be modified to deal with this constraint. This requires close interaction between logistics and operations in designing the ACS system of the future. With these strategic time horizons, the interaction needs to be continuous but not real-time. Time is available to plan and acquire a logistics infrastructure that can support more ambitious operational plans if the costs and risks are judged to be acceptable.

The second feedback loop is between logistics planning and the control of the logistics infrastructure. First, there is a diagnostic loop in which logistics constraints identify areas of the ACS system where enhancement is needed. The diagnostic results are used to focus modifications to the logistics infrastructure to enhance its capabilities at the points where such improvement is needed to support operational plans.

A tracking and control feedback loop is needed to monitor the performance of logistics processes that are not (currently) constraints and to ensure their performance remains adequate. These feedback loops and control system ensure the logistics system evolves as needed to support current and future operational plans and the system achieves and maintains the required support capability.[9] The result is a continuous cycle of planning, diagnostics, improvement, and replanning.

Planning Process Modifications and Organizational Development to Support Continuous Expeditionary ACS System Planning

The proposed support planning system likely requires integration across Air Force organizations and across commodities with one agency endowed with responsibility and authority to integrate and rationalize this global strategic planning from an Air Force perspective. While each major command (MAJCOM) and appropriate numbered air force would be responsible for developing ACS requirements based on its own area of focus, appropriately supplemented by other internal and external organizations, the requirements should be analyzed and integrated at a system level, ensuring trade-offs are made and resources are directed appropriately. There are several ways the Air Force could organize to develop the future combat support system using the process described above.

One option for integration is that the Deputy Chief of Staff, Installations and Logistics (AF/IL) could initiate organizational and process changes needed to support the new strategic ACS planning framework by creating a director for ACS Design and Development. Each of the functional areas would be represented in this organization.

Another method to integrate the development of combat support requirements across all command lines is to include them in an ACS Technology Planning and Policy Integrated Process Team (TPPIPT), which would formally review the MAJCOM outputs on a periodic basis. Membership of this TPPIPT might also be expanded to include coalition partners, academics, and *think tanks* to help ensure policy alternatives receive due attention.

A third option for accomplishing this integration would be to continue the functioning of the Air Force Directorate of Expeditionary Aerospace Force Implementation (AF/XOP) and extend its charter to evolve the ACS system of the future along with developing new employment concepts.

With regard to implementation, the Air Staff could delegate most of these responsibilities to the MAJCOMs in a system of centralized control but decentralized execution. The integrating agent, either the Director of ACS Development, the TPPIPT, or AF/XOP would provide direction and guidance to the MAJCOMs to ensure multiple area-of-responsibility (AOR) infrastructure developments are considered. As requirements are approved for development, they could be approved for funding and delegated to the MAJCOMs. Alternatively, the responsibility for acquisition and maintenance of the global support infrastructure could be the responsibility of a system program office for infrastructure at Air Force Materiel Command, which would be responsible for building the infrastructure and ensuring its performance meets the needs of operators.

Specific Elements of an ACS Planning Framework for the EAF

Based on the foregoing, the following elements can be seen to be integral components of an enhanced ACS planning framework:

- A closed loop strategic ACS planning process to develop alternative strategic ACS designs for the EAF concepts of the future. This planning framework would be provided to the MAJCOMs for development of specific AOR ACS designs in concert with the warfighting commander in chief's A3.
- Use of employment driven end-to-end requirements generation models to specify requirements as a function of operational requirements and logistics policies, practices, and technologies for important logistics commodities and processes.
- Use of support options assessment models to compute metrics to compare alternative approaches for satisfying the requirements for individual commodities and processes across the phases of operations—peacetime operations and readiness preparation, deployment, employment/sustainment, redeployment, and reconstitution.
- Use of an integration model to evaluate integrated commodity ACS structures and processes.
- Evaluation of the impacts of uncertainty and alternative transition paths to MTW operations.
- Use of measurements and assessments of actual process performance and resource levels with those that were planned.
- Designation of ACS planning and assessment responsibilities to direct and advocate the strategic system design and evolution.

The EAF concept is a radical departure from past Air Force employment concepts. It holds promise for enhancing the Air Force's ability to deal with a new and uncertain international environment while alleviating some of the serious readiness problems being caused by lengthy overseas deployments. An integrated, continuous strategic ACS planning process will enable the realization of the full potential of EAF capabilities.

Notes

1. As this concept has evolved, some of the details have been modified. At this writing, the structure consists of ten AEFs as described, including two units for pop-up contingencies and five AEFs for humanitarian/evacuation operations.
2. The term strategic is used because these decisions are affected by not only time horizons but also the geopolitical strategic situation, technology, and fiscal constraints. As will be argued, these decisions have to be made by complex trade-offs of risk and benefits using criteria that are strategic in the broadest sense.
3. Logistics planners in US Central Command Air Force have had to develop their own methods to address these questions since they may host many deployments.
4. Raymond Pyles and Robert S. Tripp, "Measuring and Managing: The Concept and Design of the Combat Support Capability Management System," Santa Monica, California: RAND, N-1840-AF, 1982.
5. To determine munitions support and avionics repair requirements and associated personnel and equipment work load, new algorithms and modeling technology had to be developed. In other cases, suitable models exist or can be modified to generate requirements for resources. Such is the case for spare parts. In this case, the Aircraft Equipment Model provides requirements for spares as a function of OPTEMPO, force module size, maintenance concept, resupply times, and so forth.
6. For example, an austere shelter option may be permissible during the first few days of a deployment but may be replaced by a more robust option as time goes on and the airlift capacity is available.
7. The model is programmed using ithink Analyst software. (ithink Analyst Technical Documentation, High-Performance, Inc., Hanover, New Hampshire, 1997).
8. For instance, an AEF operational analysis might indicate that, under some scenario variations, an AEF composed of 12 F-15Es, 12 F-16Cs, and 6 F-16CJs could produce the same results as an AEF composed of 18 B-1 bombers and 6 F-16CJs. The support requirements and corresponding support alternatives are very different for these force packages. They may also have different deterrent implications. The fighter package may involve bedding down the force closer to the adversary. Using the reception sites of a neighbor may have a greater deterrent impact than indicting to an adversary that punitive strikes may be inflicted from bomber bases located farther away. These alternatives also have different costs and risks.
9. Pyles.

Drs. Tripp, Galway, Ramey, and Killingsworth are all senior research staff members at RAND. Ms Fair is a research assistant at RAND and a doctoral candidate. Chief Drew is the Superintendent of Maintenance Analysis at the Air Force Logistics Management Agency.

Strange as it may seem, the Air Force, except in the air, is the least mobile of all the services. A squadron can reach its destination in a few hours, but its establishment, depots, fuel, spare parts, and workshops take many weeks, and even months to develop.

—Winston Churchill